

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:	)	
	)	
William Alger, et al.	)	
	)	Art Unit: 2883
Serial No.: 10/671,055	)	
	)	Examiner: Lepisto, Ryan A.
Filed: September 24, 2003	)	
	)	Attorney Docket: P17193
For: <b>OPTICAL FIBERS EMBEDDED</b>	)	
<b>IN A PRINTED CIRCUIT</b>	)	
<b>BOARD</b>	)	
_____	)	

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**APPEAL BRIEF**

Applicants submit this brief in support of Applicants' appeal from a final decision of the Examiner in the above-captioned case.

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**(i) *Real party in interest.***

The real party in interest is the assignee, Intel Corporation.

**(ii) *Related appeals and interferences.***

There are no known related appeals and / or interferences.

**(iii) *Status of claims.***

Claim 1 (Canceled)

Claim 2 (Canceled)

Claims 3-9 (Rejected)

Claims 10-14 (Canceled)

Claims 15-26 (Rejected)

Claims 3-6, 20, 22, 23, and 26 are rejected and are the subject of this Appeal Brief.

**(iv) *Status of amendments.***

The amendments filed on November 22, 2005 were entered. The amendments filed on February 23, 2006 were not entered. The attached claims appendix reflects the current status of amendments as of the date of this appeal.

**(v) *Summary of claimed subject matter.***

Claim 3 recites a circuit board. The circuit board includes a matrix material (layers 314, 316, paragraph [0033], Figure 3e). The matrix material includes a first layer (layer 314, Figure 3e) woven from a first set of fibers and a second layer (layer 316, Figure 3e) woven from a second set of fibers. There is an optical fiber integrated within the matrix material (optical fiber 304, paragraph [0033], Figure 3e). The optical fiber is sandwiched between the first layer and the second layer and is not woven into either the first or second layers (*see*, paragraphs [0028] and [0029], Figures 3c and 3e).

Claim 7 recites a circuit board. The circuit board includes a matrix material (layers 436, 438, paragraph [0039], Figure 4d). The matrix material includes a layer with a plurality of woven structural fibers, with a first woven structural fiber having a first orientation and a second woven structural fiber having a second orientation about 90 degrees from the first orientation (bundles 428, 430, paragraph [0037], Figure 4c). There are optical fibers integrated with the matrix material, the optical fibers being woven with the structural fibers to form the layer (fibers 424, 432, paragraph [0037], Figure 4c) and including a first optical fiber (fiber 424, paragraph [0037], Figure 4c) substantially having the first orientation and a second optical fiber substantially having the second orientation (fiber 432, paragraph [0037], Figure 4c).

Claim 8 recites a circuit board. The circuit board includes a matrix material (layers 436, 438, paragraph [0039], Figure 4d), and an optical fiber integrated with the matrix material (fibers 440, paragraph [0039], Figure 4d). The matrix material includes a composite layer with a plurality of woven structural fibers in bundles (bundle 416, paragraph [0036], Figure 4b; bundles 428, 430, paragraph [0037], Figure 4c) and resin

(paragraph [0038], Figure 4d). The optical fiber is woven with the structural fibers to form the layer (fibers 424, paragraph [0037], Figure 4c).

Claim 15 recites a method to form a printed circuit board. A stack that includes a first layer (layer 314, Figure 3e), a second layer (layer 316, Figure 3e), and a pattern of optical fibers (optical fiber pattern 302, paragraph [0025], Figure 3a) between the first and second layers is formed. The stack is cured to form the printed circuit board, with the pattern of optical fibers between the first and second layers (*see*, paragraphs [0028] and [0029], Figures 3c and 3e).

Claim 20 recites a method to form a printed circuit board. A plurality of fiber bundles is formed (bundle 416, paragraph [0036], Figure 4b). Each fiber bundle of the plurality of fiber bundles includes structural fibers (*see*, paragraph [0036], Figure 4b, fiberglass fiber supply 410). At least one of the plurality of fiber bundles also includes an optical fiber (optical fiber 418, paragraph [0036], Figure 4b). The plurality of fiber bundles (bundles 428, 430, paragraph [0037], Figure 4c) are woven into a structural fabric (fabric 422, paragraph [0037], Figure 4c). The structural fabric is impregnated with resin (“impregnate with resin” action 406 in Figure 4a, paragraph [0038]). The impregnated structural fabric is then cured (paragraph [0038]).



***(vi) Grounds of rejection to be reviewed on appeal.***

Independent claim 3:

- I. Is claim 3 unpatentable over Wilkinson (U.S. Pub. No. 2003/0213044) in view of Wiener (U.S. Patent No. 5,524,679)?

Dependent claim 6:

- II. Is claim 6 unpatentable over Wilkinson in view Wiener?

Independent claim 20:

- III. Is claim 20 anticipated by Wiener?

Dependent claim 26:

- IV. Is claim 26 indefinite?

(vii) *Argument.*

- I. The rejection of independent claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Wilkinson in view of Wiener is in error and should be reversed

Because the cited references fail to disclose or suggest each limitation of claim 3, the rejection is in error and should be overturned. Claim 3 recites a first layer woven from fibers, a second layer woven from fibers, and an optical fiber sandwiched between the first and second layers, without being woven into either the first or second layers. Such an arrangement can be seen in Figure 3e, below, with fibers 304 sandwiched between woven layers 314 and 316. Neither Wiener nor Wilkinson discloses optical fibers sandwiched between two layers and not woven into either of those layers.

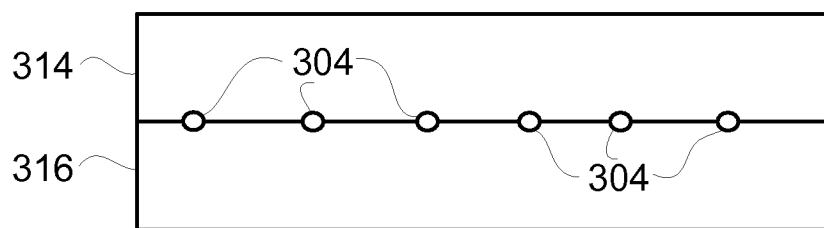
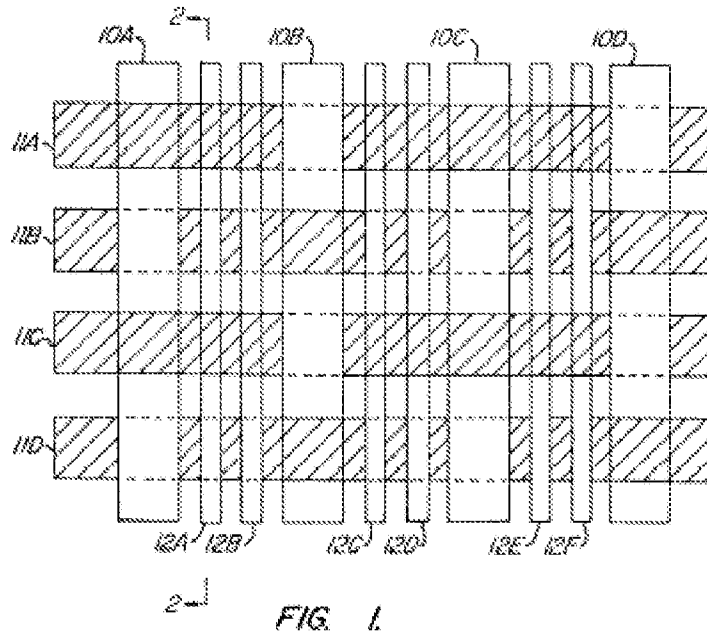


Fig. 3e

Wiener fails to disclose or suggest such an arrangement. Rather than disclosing an optical fiber between two different woven layers, Wiener merely discloses an optical fiber woven into a layer. Wiener states that, “According to the present invention, the optical fibers are **woven** into a supporting structure in channels therein.” (Wiener, col. 2, lines 38-40; emphasis added.) This weaving of the optical fibers can be seen in Figures 1 of Wiener, reproduced below, where reference numbers 12A – 12F are optical fibers,

reference numbers 10A – 10D are “warp strands” of the woven layer and reference numbers 11A – 11D are “woof strands” of the woven layer. As can be seen, the optical fibers 12A-12F are woven with the strands of the structural material.

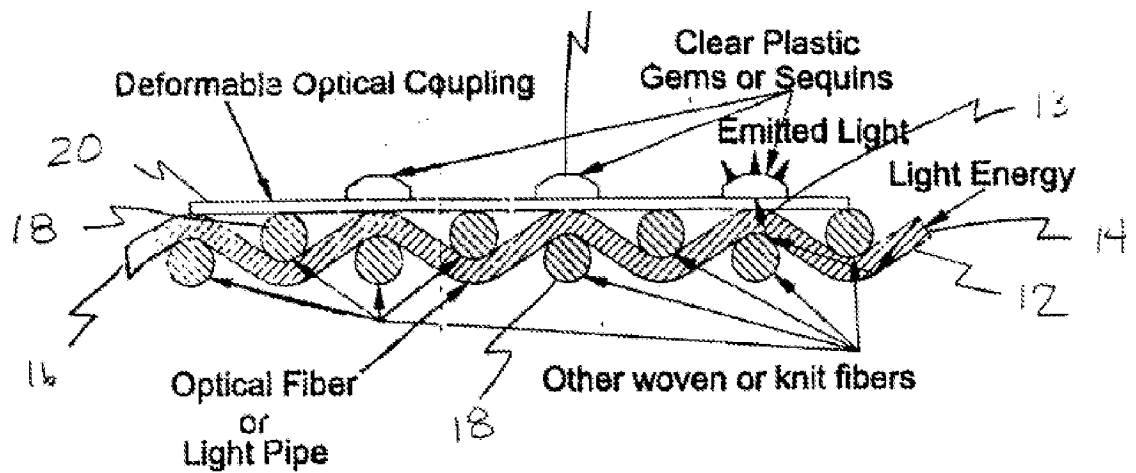


The Examiner erroneously states that Wiener, at col. 6, lines 53-58, discloses stacking and curing layers (Advisory Action, mailed March 27, 2006). This is not true. While col. 6, lines 53-58 discloses that a coating may be applied to the woven mat to provide rigidity, it does not disclose stacking the layers, much less that optical fibers are sandwiched between two woven layers without being woven into either layer, as is recited in claim 3.

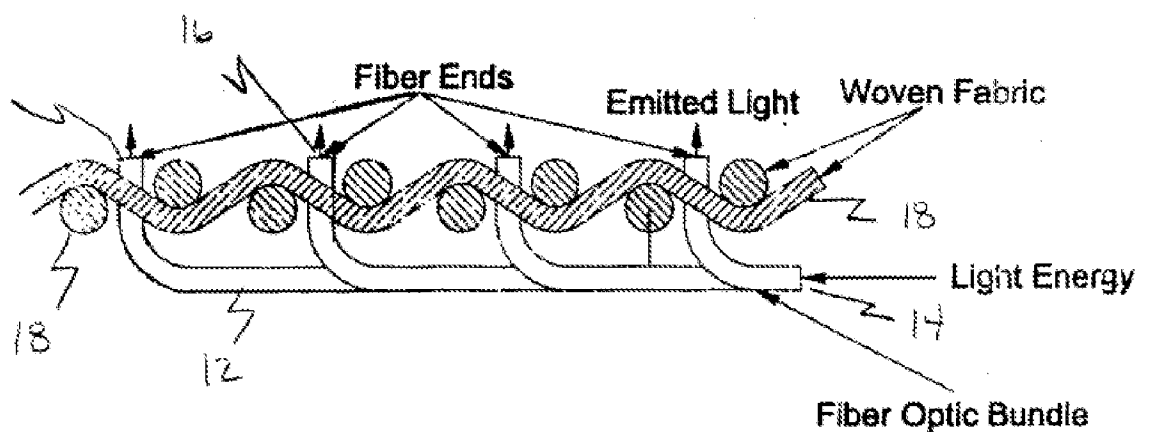
Wilkinson similarly fails to disclose or suggest optical fibers sandwiched between two layers and not woven into either of those layers. Wilkinson is related to illuminated articles, including intimate apparel (Wilkinson, paragraph [0002]). Rather than disclosing sandwiching an optical fiber between two layers without weaving the fiber into either layer as recited in claim 3, Wilkinson discloses that the, “optical fiber 12 is

interwoven with fabric fibers 18,” (Wilkinson, paragraph [0009]) in one embodiment.

This is illustrated in Figure 1, below:



Alternatively, Wilkinson discloses that the optical fibers are on one side of a single woven fabric that is preferably fabric of intimate apparel such as “panties, bras, hosiery, briefs, boxers, socks, nighties, pajamas,” etc. (Wilkinson, paragraph [0004]). The optical fibers extend through the fabric to emit light from their terminal ends (Wilkinson, paragraph [0014]). In such an embodiment, the fibers are not sandwiched between woven layers. This is illustrated in Figure 2, below:



The Examiner has mischaracterized fibers 18 of Wilkinson as the woven layers recited in claim 3 (Final Action mailed Jan. 5, 2006, page 5). Wilkinson clearly illustrates and describes reference number 18 as fibers, not woven layers (Wilkinson, Figures 1 and 2, paragraph [0009]). Claim 3 recites that the first and second layers are woven from first and second sets of fibers. Fibers 18, in contrast, are individual fibers and not layers woven from sets of fibers.

The table below summarizes differences between what is recited in claim 3 and what Wiener and Wilkinson disclose. Neither Wiener nor Wilkinson disclose an optical fiber sandwiched between woven first and second layers and not woven into either the first or second layer, as is recited in claim 3.

Claim 3	Wiener	Wilkinson
optical fiber is sandwiched between first and second layers and is not woven into either first or second layer	optical fiber is woven into layer	optical fiber is woven into layer (Fig. 1) and/or optical fiber is not sandwiched between first and second layers (Figs. 1 and 2)

Thus, because the cited references fail to disclose or suggest an optical fiber sandwiched between two layers without being woven into those layers, as recited in claim 3, the rejection is unsupported in the art and should be overturned.

Claims 4 and 5 depend from claim 3. Rejections of these claims are in error and should be overturned for the reasons provided above.

II. The rejection of claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Wilkinson in view of Wiener is in error and should be reversed

Wiener and Wilkinson fail to disclose that the optical fibers are in a grid pattern, as is recited in claim 6; the rejection is in error and should be overturned. Wiener fails to disclose or suggest such a grid pattern, instead teaching that all of the optical fibers should be in a single parallel orientation, with “zero degree warp” (Wiener, col. 2, lines 40-42; col. 5, lines 9-12). Wilkinson’s Figures and text are completely bereft of any disclosure or suggestion of optical fibers in a grid pattern. Because neither reference discloses or suggests the limitations recited in claim 6, the rejection should be overturned.

III. The rejection of claim 20 under 35 U.S.C. § 102(b) as being anticipated by Wiener is in error and should be reversed

Wiener fails to disclose forming fiber bundles with structural fibers, at least some of the fiber bundles including an optical fiber, and then weaving these bundles into a structural fabric as recited in claim 20. Such a bundle formation followed by weaving of the bundles are described at paragraphs [0036] and [0037] and can be seen in Figures 4b and 4c.

Rather than forming bundles and then weaving the bundles, Wiener only discloses weaving individual warp and woof fibers, with optical fibers in a separate channel. There is no disclosure within Wiener of formation of fiber bundles with both structural fibers and at least one optical fiber. There is no disclosure in Wiener of weaving such bundles into a structural fabric. Because Wiener fails to disclose each limitation recited in claim 20, the rejection is in error and should be reversed.

Claims 22 and 23 depend from claim 20. Rejections of these claims are in error and should be overturned for the reasons provided above.

IV. The rejection of claim 26 under 35 U.S.C. § 112, second paragraph, as being indefinite is in error and should be reversed

The Examiner asserted claim 26 was indefinite. Claim 26 recites that optical fibers between first and second layers are not woven into a layer. The Examiner stated, “forming optical fibers between two layers forms an optical fiber woven into a layer.” (Final Office Action, mailed January 5, 2006, page 2.) This is not correct. An optical fiber is not woven into two other layers just by being between those two layers. For example, a person may sleep at night between an upper woven layer (a sheet and/or blanket) and a lower woven layer (a sheet), yet that person is not woven into either one of those layers; that person is simply between the layers. The rejection of claim 26 under 35 U.S.C. 112 should be reversed.

While claim 26 was only rejected under 35 U.S.C. 112 in the Final Office Action mailed Jan. 5, 2006, the last paragraph of the Advisory Action mailed March 27, 2006 makes it appear as though the Examiner believes that Wilkinson and/or Wiener would support a rejection of claim 26. Any such rejection should be reversed.

Claim 26 recites optical fibers between first and second layers, and that the optical fibers are not woven into a layer. Wiener only discloses optical fibers that are woven into a layer; Wiener fails to disclose optical fibers between first and second layers without being woven into a layer. Wilkinson also fails to disclose optical fibers between first and second layers without being woven into a layer. The references, alone or in

combination, fail to disclose or suggest optical fibers between first and second layers, and that the optical fibers are not woven into a layer.



## CONCLUSION

For the foregoing reasons, applicant respectfully requests the Board to vacate the examiner's rejections of claims 3-6, 20, 22, 23, and 26, to remand this application to the Examiner, and to direct the Examiner to pass this case to issuance.

Respectfully submitted,

Date: May 18, 2006

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**(viii) *Claims appendix.***

3. A circuit board, comprising:
  - a matrix material comprising:
    - a first layer woven from a first set of fibers; and
    - a second layer woven from a second set of fibers;
  - an optical fiber integrated with the matrix material; and
  - wherein the optical fiber is sandwiched between the first layer and the second layer and is not woven into either the first or second layers.
4. The circuit board of claim 3, wherein the optical fiber is part of an optical fiber pattern with a plurality of optical fibers and the optical fiber pattern is between the first layer and the second layer.
5. The circuit board of claim 4, wherein the optical fibers in the optical fiber pattern have preselected locations within the optical fiber pattern.
6. The circuit board of claim 5, wherein the optical fibers in the optical fiber pattern are in a grid pattern with preselected spacings between the optical fibers that make up the grid.
7. A circuit board, comprising:
  - a matrix material;
  - optical fibers integrated with the matrix material; and
  - wherein:

the matrix material includes a layer with a plurality of woven structural fibers, with a first woven structural fiber having a first orientation and a second woven structural fiber having a second orientation about 90 degrees from the first orientation; and  
the optical fibers are woven with the structural fibers to form the layer, wherein the optical fibers include a first optical fiber substantially having the first orientation and a second optical fiber substantially having the second orientation.

8. A circuit board, comprising:

a matrix material;

an optical fiber integrated with the matrix material; and

wherein:

the matrix material includes a layer with a plurality of woven structural fibers;

the optical fiber is woven with the structural fibers to form the layer;

the layer with a plurality of woven structural fibers is a composite layer of woven fiberglass bundles and resin; and

the optical fiber is woven into the layer as part of one of the bundles.

9. The circuit board of claim 8, wherein:

the woven fiberglass bundles each include an optical fiber within the bundle; and

the optical fibers within the bundles are substantially at a preselected location within the circuit board.

15. A method to form a printed circuit board, comprising:

forming a stack that includes a first layer, a second layer, and a pattern of optical fibers between the first and second layers; and  
curing the stack to form the printed circuit board, wherein the pattern of optical fibers are between the first and second layers in the circuit board.

16. The method of claim 15, wherein the first and second layers are prepreg fiberglass layers.

17. The method of claim 15, wherein the optical fibers in the pattern of optical fibers have preselected locations within the optical fiber pattern.

18. The method of claim 17, wherein the optical fibers in the pattern of optical fibers have preselected locations within the pattern of optical fibers.

19. The method of claim 18, wherein the optical fibers in the pattern of optical fibers are in a grid pattern with preselected spacings between the optical fibers that make up the grid.

20. A method to form a printed circuit board, comprising:

forming a plurality of fiber bundles, each fiber bundle comprising structural fibers and at least one of the plurality of fiber bundles further comprising an optical fiber;  
weaving the plurality of fiber bundles into a structural fabric;  
impregnating the structural fabric with resin; and  
curing the impregnated structural fabric to form the printed circuit board.

21. The method of claim 20, wherein:

each of the plurality of woven fiberglass bundles includes an optical fiber within the bundle; and  
the optical fibers within the bundles are substantially at a preselected location within the circuit board.

22. The method of claim 20, wherein:

the cured impregnated structural fabric is a first layer of the printed circuit board;  
and  
the printed circuit board has a plurality of layers.

23. The method of claim 22, further comprising:

forming a stack that includes the first layer, a second layer, and a pattern of optical fibers between the first and second layers; and  
curing the stack to form the printed circuit board, wherein the pattern of optical fibers are between the first and second layers in the circuit board.

24. The circuit board of claim 9, wherein the optical fibers within the bundles are in a grid pattern.

25. The method of claim 15, wherein the pattern of optical fibers between the first and second layers are in a grid pattern.

26. The method of claim 15, wherein the optical fibers in the pattern of optical fibers between the first and second layers are not woven into a layer.

**(ix) *Evidence appendix.***

As the record and this appeal do not rely upon any evidence submitted under 37 CFR 1.130, 1.131, or 1.132, no evidence is listed herein. The record and this appeal only rely upon the record itself, the patent code (35 U.S.C.), the patent rules (37 CFR), the MPEP, case law, and the cited references.

**(x) *Related proceedings appendix.***

As stated in section (ii), above, there are no known related proceedings.